

Ratios & Proportions

Content Area: Mathematics (Geometry)

Grade Level: 8th grade

Projected Duration: 50 minutes

Stage 1 - Desired Results

Established Goals:

CCS 8.EE: Understand the connections between proportional relationships, lines & linear equations.
5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.
Model with mathematics.

Understandings:

Students will understand that...

- A ratio compares two numbers by division
- A proportion is an equation stating that two ratios are equal
- The cross products are the products of the extreme and means of two proportions
- Different ratios can show the same proportion

Essential Questions

- What is the difference between a ratio and a proportion?
- Where do you see ratios and proportions in the real world?
- How do you use ratios and proportions in the real world?
- How do we use proportions to solve problems using distance?

Students will know...

- Definitions of ratio, proportion, extremes, means and cross products
- The difference between a ratio and a proportion

Students will be able to...

- Write and simplify ratios
- Use proportions to solve problems
- Use the cross product property to solve proportions
- Write a ratio expressing the slope of a line
- Identify the means and extremes of a proportion

Stage 2 - Assessment Evidence

Performance Tasks:

- Given a map with landmarks surrounding the school, students will measure the distance in inches and compute how many miles away each landmark is. A scale of 1 inch=1 mile will be drawn on the map, but students will not be explicitly told to use it.

Other Evidence:

- Assessment of student work
- Written explanations to justify work
- Teacher observations of students working on tasks
- Rubric related to performance tasks
- Exit ticket

Stage 3 - Learning Plan

Learning Activities

- Students will begin by examining a map of their school and the surrounding area. They will be asked to measure and compute the distance from the school to three landmarks surrounding the area. A scale will be written directly onto the map. This will be used as an exploration activity and the teacher will offer minimal intervention.
- Students will be given an opportunity to share their results and their methods for computing the distances.
- The teacher will demonstrate how to compute the distance with the given scale. This will lead to a discussion on ratios and the teacher will present the formal definition.
- The teacher will demonstrate how to write the slope of a line as a ratio. The teacher will also demonstrate that two different points on the line will produce the same ratio.

- The teacher will demonstrate another way of writing ratios $a:b$ and will show how it relates to dimensions of quadrilaterals. Also present a real-world example of how the size of television and computer screens are written as ratios.
- Students will write the slope of two coordinate points as a ratio on their whiteboards and hold them up for the teacher to assess.
- The teacher will present the concept that a proportion is an equation that states two ratios are equal. Examples will be given on the board of some proportions.
- The teacher will demonstrate the cross product property and explain the meaning of the terms extremes and means.
- Students will be given two proportions to solve using the cross product property. The teacher will informally observe students and assess understanding.
- The teacher will link the lesson back to the map problem and give another example of how ratios and proportions are used in real life.
- An exit ticket will be given where students will write the big idea they learned from the lesson and what questions remain unanswered.

Extension Activities

- Students will begin problems #1-16 from pg 457 of the Burger (2008) text in class if time allows and will complete the problems at home. The teacher will review the problems in class the following day.

Differentiation

- Teacher will show students several scale models such as a model car, globe and map and explain that these all use ratios and proportions.
- For students who are English-learners, the teacher will create an additional worksheet that asks students to label different examples as "proportion" or "ratio", to allow these students to get used to the academic language.
- For high-achieving students, the teacher will provide an additional "challenge" problem in the classwork/homework that use the concepts of percentage and circumference.